What is claimed is:

Claim 1. A method of processing an input seismic record comprising:

(a) determining a primary components record from the input seismic record;

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(b) obtaining a residual record from the input seismic record and the primary components record;

(c) obtaining a next primary components record from the residual record; and

(d) combining the primary components record and the next primary components record to obtain a reconstructed record.

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Claim 2. The method of claim 1 further comprising obtaining a subsequent residual record from at least one of: (i) the reconstructed record; (ii) the input seismic record; and (iii) the residual record.

15 **Claim 3.** The method of claim 2 further comprising obtaining a subsequent primary components record from the subsequent residual record.

Claim 4. The method of claim 3 further comprising combining the subsequent primary components record with at least one of:

20 i) said primary components record;

ii) the next primary components record;

iii) the subsequent primary components record;

iv) the residual record; and

v) the subsequent residual record.

Claim 5. The method of claim 1 wherein the input seismic record further comprises at

least one of:

i) shot gathers,

ii) receiver gathers,

iii) cdp super-gathers,

iv) Ostrander gathers,

v) reconstructed record gathers,

vi) offset gathers; and

vii) angle gathers.

Claim 6. The method of claim 1 wherein determining a primary components record and

a next primary components record further comprises processing with one of : (i) a

data projection technique; (ii) an AVO projection technique, (iii) a multiple

attenuation process, (iv) a Radon transform, (v) statistical thresholding methods, and

(vi) wavefield separation methods.

Claim 7. The method of claim 1 wherein obtaining said residual record from the input

seismic record and the primary components record further comprises determining a

difference between the seismic record and the primary components record.

Claim 8. The method of claim 1 wherein combining the primary components record and the next primary components record comprises adding the primary components and the next primary components record.

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Claim 9. The method of claim 1 further comprising using statistical methods to determine the goodness of fit between a modeled signal and at least one of: i) the residual record; ii) the primary components record; iii) the next primary components record; and iv) the reconstructed record.

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Claim 10. A computer readable medium containing executable instructions that when executed by a computer perform a method for processing an input seismic record comprising:

(a) determining a primary components record from the input seismic record;

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(b) obtaining a residual record from the input seismic record and the primary components record;

(c) obtaining a next primary components record from the residual record; and

(d) combining the primary components record and the next primary components record to obtain a reconstructed record.

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Claim 11. The medium of claim 10 further comprising instructions for obtaining a subsequent residual record from at least one of: (i) the reconstructed record; (ii) the input seismic record; and (iii) the residual record.

Claim 12. The medium of claim 11 further comprising instructions for obtaining a subsequent primary components record from the subsequent residual record.

Claim 13. The medium of claim 12 further comprising instructions for combining the subsequent primary components record with at least one of: i) said primary components record, and ii) next primary components record.

Claim 14. The medium of claim 10 further comprising instructions for selecting from at least one of the group seismic gathers comprising at least one of: (i) shot gathers, (ii) receiver gathers, (iii) cdp super-gathers, (iv) Ostrander gathers, (v) reconstructed record gathers, (vi) offset gathers, and (vii) angle gathers.

Claim 15. The medium of claim 10 further comprising instructions for determining a primary components record and a next primary components record including processing with one of (i) a data projection technique; (ii) an AVO projection technique, (iii) a multiple attenuation process, (iv) a Radon transform, (v) statistical thresholding methods, and (vi) wavefield separation methods.

Claim 16. The medium of claim 10 further comprising instructions for obtaining a residual record from the input seismic record and the primary components record by determining a difference between the seismic record and the primary components record.

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Claim 17. The medium of claim 10 further comprising instructions for combining the primary components record and the next primary components record by adding the primary components record and the next primary components record.

10   **Claim 18.** The medium of claim 10 further comprising instructions for using statistical methods to determine the goodness of fit between a modeled signal and at least one of: i) the residual record; ii) the primary components record; iii) the next primary components record; and iv) the reconstructed record.

15   **Claim 19.** A computer system comprising:

(a) a reading device to read stored seismic data;

(b) a processor;

(c) a memory;

(d) code for determining a primary components record from an input seismic record;

20   (e) code for obtaining a residual record from the input seismic record and the primary components record;

(f) code for obtaining a next primary components record from the residual record; and

(g) code for combining the primary components record and the next primary components record to obtain a reconstructed record.

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Claim 20. A machine readable medium having stored thereon code for:

(a) determining a primary components record from an input seismic record;

(b) obtaining a residual record from the input seismic record and the primary components record;

10   **(c)** obtaining a next primary components record from the residual record; and

(d) combining the primary components record and the next primary components record to obtain a reconstructed record.